

*

() ()
 (30) (16-15)
 ()
 : () ()
 ()
 ()

(Stored (Galileo, 2000) (Plyometric Training) :
 (Stretch Reflex)
 .Elastic Energy)

.1

:
 (Isometric) :

Iso)

.2005/6/22

2004/3/10

*

.(Metric

.(2000)

(Isotonic)

:

•

(Isotonic)

" "

(Kilani, 1988) (Excised)

(Deep Jump)

.(Wilt, 1975)

(Kilani, (Anisometric-Anisotonic)

1988)

(Muscle Spindles)

.1

(Stretch Reflex)

(Stretching-

(Komi, 1984) Shortening Cycle)

.2

.(Kilani, 1987) (Komi, 1984)

(1975) Wilt (2000)

(1999)

(1984) Komi

(Eccentric

Contraction)

.(Concentric Contraction)

(Power)

(1988)

.(1988)

(1989)

(1998)

()
(GTO)

(Passive)

(Elastic Energy)

(Amortization Phase)

(Stiffness)

(Compliance)

(Kilani, 1989; Kilani, 1999; Galileo, 2000; Schmidtbleicher, Zatsiorky and Baltzopoulos, 2002)

()

(Eccentric)

(Rung, 2000) %18

(Concentric) (

)

(Spitzenpfeil, 1997) %40

.(Kilani, 2000, b)

:

.1

(Stress

.2

)

(Hamill Knutzen, 1995) Fracture)
(2000b) (1988

.3

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)

(

(

.1

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.3

()

()

.(Neusy, 2000)

:(Plyometric)

-

.(Jiang et al, 1999)

(Schmidtbleicher, Zatsiorsky and

.Baltzopoulos, 2002)

:(Galileo, 2000)

-

:(Stretch Reflex)

-

(16-15)

:

- ()

(Concentric)

-

.(Kilani, 1989)

:(Stored Elastic Energy) -

.(3) (2)

-

:(Jumping Boxes) -

: 40 30 20 :

•

•

(15)

(30) (20) :
(50)

(40) (40)

.2

(20)

()

()

(30)

6

(40)

(10)

:

%.40 (4)

%.60 (6) -2002)

%.50 (5) (16-15) (2003)

%.70 (7)

%.90 (9)

%.50 (5) (30)

				(Schmidtbleicher, 2002) (6-4)	
(5)				(5-3)	-
	600	10		:	-
6				(30)	-
:				=	× 30
					300 = 10 × 30
(400-		200)		.%100	270 = 9 × 30
				.%90	240 = 8 × 30
			.%40	.%80	210 = 7 × 30
				.%70	180 = 6 × 30
	(600-300)			.%60	150 = 5 × 30
			.%60	.%50	120 = 4 × 30
.%50		(500-200)		.%40	
				3	6
.%70		(400-200)			:
					-
.%90		(600-300)			
				.()
.%50		(500-200)			
:					
.%60-40			-		
.%90 -70			-		(15)
.%100			-		(5)
5)				(
			:	:()
	1900	•		:	
	.%90				
	1500	•		:	
	.%80				
	1200	•		:	

- .%70
- 1900 •
- .%60
- 1500 •
- .%50
- 1200 •
- .%40

(1)



(1)

(1)

	0.338	0.976	2.8	0.406	0.959-	2.82	10.74	62.6	65.4	
	0.097	1.71	0.04	0.005	0.230	0.055	0.082	1.77	1.72	
	0.061	1.95	1.2	1.242-	0.104	1.50	1.84	47.6	46.4	()
	0.489	0.702	0.60	0.000	0.814	2.92	1.54	12.0	11.4	
	0.756	0.314	1.4	1.605	1.068	12.20	12.18	54.6	53.28	
	0.09	1.80	1.8	0.435	0.405	2.17	1.20	10.0	8.20	()

.2.048

(0.05 ≥ α)

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.() -
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 .() -
 (1)

(2)

(1)
 " "

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.1
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.3
.4
:
()
.1
.2
.3

(0.976) " "
 (1.71)
 (1.95) ()
 (0.314) (0.702)
 .(1.80) ()
 (0.338)
 (0.061) (0.097)
 (0.489) ()
 (0.756)
 .() (0.09)
 (0.05)
 (2.048)

(3)

1.068 0.23)
 ()
 1.605 0.005)
 ()
 .3 ±

:
.1
.2
.3
.4
:

(40 30 20) :
 .(50) (40)

.1
.2
.3
.4
.5
.6

:()	
.1	.1
.2	.2
.3	() (Eccentric)
.4	- .() (Concentric)
.5	-
.6	.3
(Balance)	(Stabilization)
	.4

(10)

.3

(4)

(4)

.(30 =)

*0.026	0.768	0.048	0.102	1.98	2.00	
**0.003	0.892	4.71	4.06	55.25	56.25	()
*0.045	0.717	0.707	1.06	11.75	11.37	
**0.001	0.974	7.04	8.78	53.75	54.00	
*0.043	0.722	0.64	0.92	8.87	8.00	()

.(0.05 ≥ α)

(0.001) (0.974) (Test-Retest)
(0.892) () ()
(0.003) (0.05 ≥ α)

(3) (0.026) (0.768)
 -10 2003-3-29 (0.722) ()
 (18) 2003-5 (0.043)
 : (0.717)
 : • .(0.045)
 : •
 / : (3/23-3/18)
) •
 (•
 •
 (2003-5-12) •
 ()
 .3
 (1) •
 2003/3/27
 (5) () •
 (5)
 ()

.(15 =) .

	0.073	1.939	0.6	3.62	2.82	63.2	62.6		
	*0.001	5.787	0.45	0.30	0.055	2.22	1.77		
	*0.001	11.587	9.2	2.80	1.50	56.8	47.6		()
	0.081	1.883	1.33	1.71	2.92	10.66	12.0		

	0.820	0.231	0.6	4.34	12.20	54.0	54.60		
	*0.009	3.055	0.8	1.89	2.17	10.8	10.0		()

.2.048 (0.05 ≥ α)

(0.081) (1.883)
 (0.820) (0.231) " "
 ()
 (0.009) (3.055) (1.939) " "
 (2) (0.001) (5.787) (0.073)
 (0.05 ≥ α)
 (11.587)
 (0.001)
 (6) () " "
 (6)
 ()
 .(15 =)

	0.301	1.07	0.4	10.64	10.74	65.0	65.4		
	0.506	0.683	0.032	0.14	0.082	1.76	1.72		
	*0.015	2.76	4.4	6.62	1.84	50.8	46.4		()
	0.078	1.89	0.86	0.63	1.54	10.53	11.4		
	0.441	0.792	0.08	4.55	12.18	53.2	53.28		
	0.294	1.09	0.6	1.01	1.20	8.8	8.2		()

.(0.05 ≥ α)

.2.048 (0.05 ≥ α) *

(0.683)
 (0.506) " "
 (0.015) (2.76) ()
 (1.89) " " ()
 (0.792) (0.078) (0.301) (1.07)

...

(3) .(0.294) (1.09) (0.441)
)
 .() (0.05)
 ≥ α (0.05) (0.015)
 (7) () (0.05)

(7)
 ()
 .(30 =)

	0.54	0.62	1.8	3.62	10.64	63.2	65.0		
	0.0001	5.36	0.46	0.30	0.14	2.22	1.76		
	0.0003	3.23	6.0	2.80	6.62	56.8	50.8		
	0.133	0.282	0.13	1.71	0.63	10.66	10.53		
	0.096	1.723	0.8	4.34	4.55	54.0	53.2		
	*0.001	3.60	2.00	1.89	1.01	10.8	8.80		()

.2048 (0.05 ≥ α) *

.4 ()
 ()
 ()

(5) (0.05 ≥ α)
 (5.36) ()
 .() (0.0001)
 (0.0003) (3.23) ()
 (3.60) () (0.001)
 ()
 (0.282) (0.54) (0.62)
 .(0.096) (1.723) (0.133)

(4.4)

(1989) (2000a) (1993)
(1987) (1999) (2000)
(Cavanga and Citrio, 1974)

(Thys, 1972)

(Spitzenfeil, 1997)
%40

%75-25

(Bosco, 2000)

(1999) (1989)
(Fatouros et al., 2000) (Kilani, 2000a)

()

(2002)

()
()

(7)

(6)

()
()

(2000)

.5

(Cavanga et al., 1974)

:

(Thys, 1972)

.1

()

.2

.3

()

(7)

()

.6

:

.1

.2

- .3
- .5
- .4
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The Development of Explosive Strength through Involuntarily Vibrations and Plyometric Training

*Hashem A. Kilani and Haya M. Al-Qatami **

ABSTRACT

The purpose of this study was to investigate the effect of the involuntary vibrational and the plyometric exercises routine on developing explosive strength, and to compare the results of the two routines. Thirty (30) handball players, aged (15-16 yrs.) were selected from Al-Ittihad secondary schools and were divided into two equal experimental groups which served as the subjects of this study; the plyometric exercise group and the vibrational exercise group (using Galileo apparatus). Weight, standing long jump, vertical jump, half squat, thigh circumference and skinfold of the right leg thigh were measured for all subjects before and after the two months training routine. Results indicated that there is an effect of using plyometric exercises on standing long jump, vertical jump, half squat and leg muscles force. However, the only statistical significant effect of the vibration routine was seen only on the vertical jump variable. It was suggested that plyometric exercises are still the best routine in developing explosive strength especially for athletes. Nevertheless, the involuntary vibration routine needs further research using different subjects and longer time duration to strengthen the explosive strength as it was achieved by the plyometric one.

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